

Focus . . . Infectious Disease Mortality Trends

The spectrum of infectious diseases is expanding and many infectious diseases once thought to be conquered are increasing.¹ Recent events such as a newly discovered *Hantavirus* pulmonary syndrome foodborne and waterborne outbreaks caused by *Escherichiae coli* O157:H7 and *Cryptosporidium* and the currently growing crisis of antibiotic resistance have demonstrated the emergence and reemergence of infectious diseases. The causes for this resurgence are many and complex and include microbial adaptation and change; changes in human demographics and behavior; changes in the environment; the increases in national and international travel; changes in food handling shipping and processing; and breakdowns in public health measures for previously controlled infections (e.g., cholera, tuberculosis [TB], pertussis).¹

In addition, overall deaths due to infectious diseases are increasing. In the United States the crude death rate due to infectious diseases as the underlying cause-of-death increased 58 percent from 1980 through 1992.² As Figure 1 shows, age-adjusted mortality increased 39 percent during the same period.² While acquired immunodeficiency syndrome (HIV/AIDS) accounted for many of these deaths others involved long-recognized killers such as TB and pneumonia.

To address the challenges of emerging infectious disease threats, the Centers for Disease Control and Prevention (CDC) in partnership with state and local health departments, other federal agencies, academic institutions, health care providers, international and public service organizations, has developed a strategic plan, *Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States*.¹ Published in 1994, the plan emphasizes the improvement and expansion of infectious disease surveillance; applied research; prevention and control activities; and also proposes to strengthen the public health laboratory infrastructure.¹ The implementation of this plan would result, among other things, in investigations needed to more accurately monitor trends in infectious disease morbidity and mortality.² In this report we evaluated trends in infectious disease mortality for Missouri residents and compared these results with recent documented national trends that show that infectious disease mortality for the United States has been increasing.

Methods

The current disease classification system, *International Classification of Diseases, 9th Revision* (ICD-9), does not readily allow assessment of the aggregate burden of infectious diseases.² Although ICD-9 contains a set of codes (001-139)³ labeled as infectious diseases, this grouping leaves out many infectious diseases. The ICD-9 places many infectious diseases in non-infectious categories (such as the classification of endocarditis among cardiovascular diseases and the classification of meningitis and middle ear infections among diseases of the nervous system and sense organs, respectively).¹ Fewer than half of deaths directly attributable to infectious diseases are labeled explicitly as infectious in this classification system.² Therefore, to assess more accurately the overall burden of infectious disease mortality for Missouri residents, a recoding scheme developed by CDC classifying ICD-9 codes as infectious diseases, consequence of infectious diseases, or not infectious diseases was used. This recoding scheme categorized an additional 377 ICD-9 codes as either infectious diseases or consequences of infections. This recoding scheme was used in the national study and was obtained from the National Technical Information Services (order number PB96-500194).²

A total of 1,131 codes that in all cases represent either infectious diseases or consequence of an infectious disease, were applied to the Missouri death files for the years 1980 through 1992 (the years of the national study), focusing on the underlying cause-of-death. To obtain more recent estimates for Missouri, the analysis was extended to the year 1995, the most recent year for which final data are available. The total annual number of deaths of Missouri residents coded to each infectious disease ICD-9 recode as the underlying cause-of-death was calculated and stratified by demographic variables. The crude rates of infectious disease deaths were age-adjusted to US 1980 population.

Results 1980 to 1992

From 1980 to 1992, infectious diseases were the underlying cause-of-death in 37,867 (5.8 percent) of the 647,411 total Missouri resident deaths.

For Missouri residents, the age-adjusted death rate due to infectious diseases as the underlying cause-of-death increased approximately 28 percent (from 41.6 to 53.2 deaths per 100,000) between 1980 and 1992 (Figure 1). In comparison, the infectious disease age-adjusted mortality for US residents increased 39 percent for the same time period (Figure 1).² Deaths due to respiratory tract infections, septicemia and HIV/AIDS account for most of this increase for Missouri (Figure 2) and the U.S. In Missouri, between 1980 and 1992, the death rate due to respiratory tract infections increased 19.2 percent, from 31.2 to 37.2 deaths per 100,000. The death rate from septicemia increased

89.8 percent, from 4.2 to 8.0 deaths per 100,000 for the same time period. HIV/AIDS deaths increased from none in 1980 to 8.8 per 100,000 in 1992.

From 1980 to 1992, for Missouri and U.S. residents, there was a decline in the infectious disease death rate among children younger than 5 years (see Figure 3).

For Missouri and U.S. residents, infectious disease mortality was highest among those aged 65 years and older. Between 1980 to 1992, there was a 27 percent increase in the rate of infectious disease deaths (from 289.6 to 368.7 deaths per 100,000) among Missourians ages 65 and over (Figure 3). For the US, there was a 25 percent increase in infectious disease death rates for the same time period (from 271 to 338 per deaths 100,000).

The infectious disease death rate is increasing at the fastest rate for ages 25 to 44, for Missouri and the U.S. primarily because of HIV/AIDS. Between 1980 to 1992, the rate for this age group increased five fold from 5.6 to 28.3 deaths per 100,000 for Missouri residents (Figure 3). For the U.S., the comparable rate increased from 6 to 38 deaths per 100,000 for the same time period.²

Infectious disease death rates increased in both sexes, from 1980 to 1992, with infectious disease mortality among males higher than among females in practically each age group for Missouri and the US.

For Missouri residents, the infectious disease death rate in whites increased about 24.3 percent (from 40.3 to 50.1 deaths per 100,000) from 1980 to 1992 (Figure 4). For African Americans, the infectious disease death rate increased approximately 46.2 percent (from 57.1 to 83.5 deaths per 100,000) for the same time period (Figure 4). For the U.S., the 1992 infectious disease death rate among African Americans was 88 per 100,000; 36 percent higher than for the population as a whole.²

Results 1992 to 1995

For Missouri residents, between 1992 and 1995, the age- adjusted death rate due to infectious diseases as the underlying cause-of-death increased an additional 10.3 percent (from 53.2 to 58.7 deaths per 100,000). In 1995, infectious diseases were the underlying cause-of-death for 4,045 (7.5 percent) of the 54,222 Missouri resident deaths.

From 1992 to 1995, infectious disease death rates among Missouri residents ages 65 and over, increased from 368.7 to 410.5 deaths per 100,000.

From 1992 to 1995, among Missouri residents ages 25 to 44, the infectious disease death rate increased an additional 7.4 percent (from 28.3 to 30.4 deaths per 100,000), indicating a slowing of the increase. In Missouri, from 1992 to 1995, the infectious disease death rate among males increased from 70.9 to 75.2 deaths per 100,000. The infectious disease death rate among females increased from 39.1 to 45.2 deaths per 100,000 for the same time period.

In Missouri, from 1992 to 1994 (the latest year for which rates could be calculated by race), the infectious disease death rate in whites increased from 50.1 to 55.1 deaths per 100,000. For African Americans, the infectious disease death rate increased from 83.5 to 91.6 deaths per 100,000 for the same time period.

Discussion

In summary, the data presented in this report show that infectious disease mortality in Missouri has been increasing since 1980. Missouri findings are similar to national trends for the 1980 to 1992 period. The rate of increase was steepest among people 25 to 44 years old and largest among the elderly. In Missouri, the upward trend continued for the 1992 to 1995 period.

In 1995 in Missouri, three causes (pneumonia and influenza, HIV/AIDS, and septicemia) of the top 12 leading causes of death were infectious disease related. In 1980, only pneumonia and influenza ranked in the top 12. During 1995, pneumonia and influenza were the fifth leading cause of death, affecting mainly the elderly. AIDS is the third leading cause of death for Missourians 25 to 44 years of age.

Most of the differences in the rate of increase between Missouri and the U.S. (28 vs. 39 percent) is due to HIV/AIDS. In the U.S., when HIV/AIDS deaths listed on the death certificate were subtracted from the total number in which infectious diseases were the underlying cause-of-death, a 22 percent increase remained in the infectious disease death rate between 1980 and 1992,² compared with a 20.1 percent increase in Missouri in the same subset of causes excluding HIV/AIDS.

The findings presented in this report are limited by the validity of the diagnostic information recorded on death certificates.

Infectious diseases increasingly threaten public health and contribute significantly to the escalating costs of health care.¹ Prevention and control of infectious diseases require a variety of public health strategies.² To reduce the incidence and prevalence of some infectious diseases, in its strategic plan, the Missouri Department of Health, Division of Environmental Health and Communicable Disease Prevention, has addressed specific infectious disease threats, such as HIV/AIDS, TB, STDs, and vaccine-preventable diseases. Following are some of the goals included in the plan:

- To create a state-of-the-art disease surveillance system for the early detection of emerging infections, outbreaks, and environmental health threats;
- To ensure that all active TB patients are placed on directly observed therapy;
- To increase the number of patients initially treated with four TB medications;
- To increase the number of eligible Missourians who receive all the age-appropriate recommended immunizations;
- To reduce the incidence of vaccine-preventable diseases and support their global eradication;
- To assure that 100 percent of Missourians have access to timely and quality STD/HIV prevention and treatment services;
- To prevent all new STD/HIV infections in the state of Missouri

To accomplish these goals will require collaborations and partnerships with local health departments, federal agencies, public and private laboratories, health care providers, and local communities.

References

1. Center for Disease Control and Prevention, *Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States*. Atlanta, GA: US Department of Health and Human Services, Public Health Service; 1994.
2. Pinner RW, Teutsch SM, Simonsen L, et al. Trends in Infectious Diseases Mortality in the United States. *JAMA*. 1996;275:189-193.
3. World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, Based on Recommendations of the Ninth Revision Conference*, 1975. Geneva, Switzerland: World Health Organization; 1977.

Figure 1

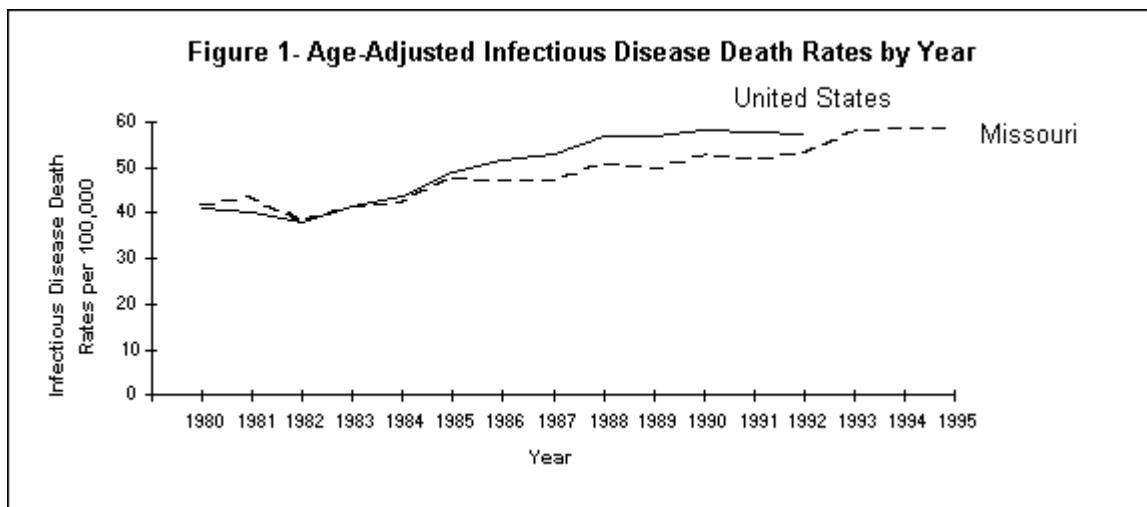


Figure 2

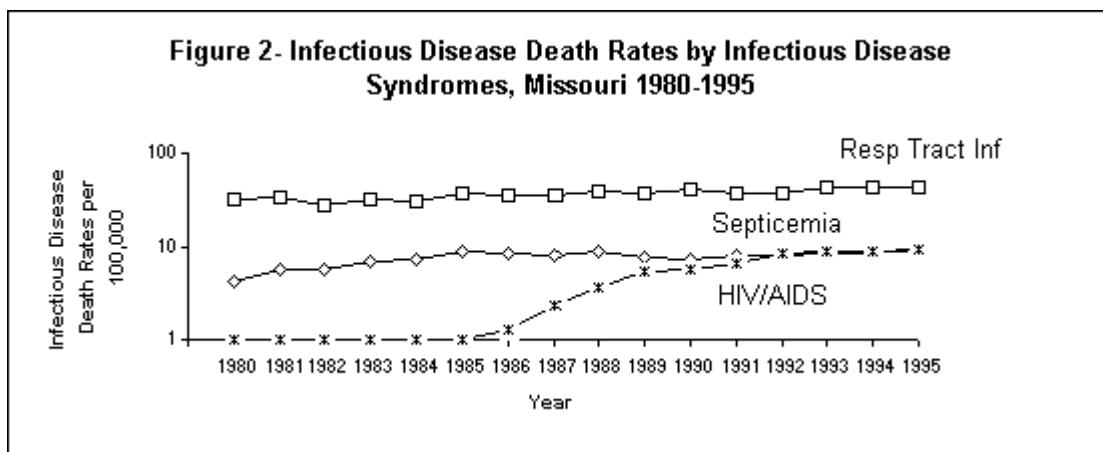


Figure 3

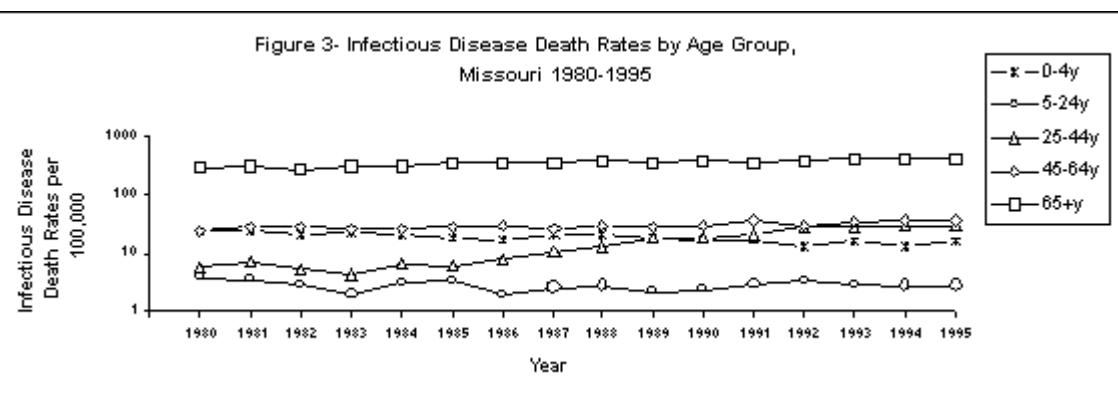
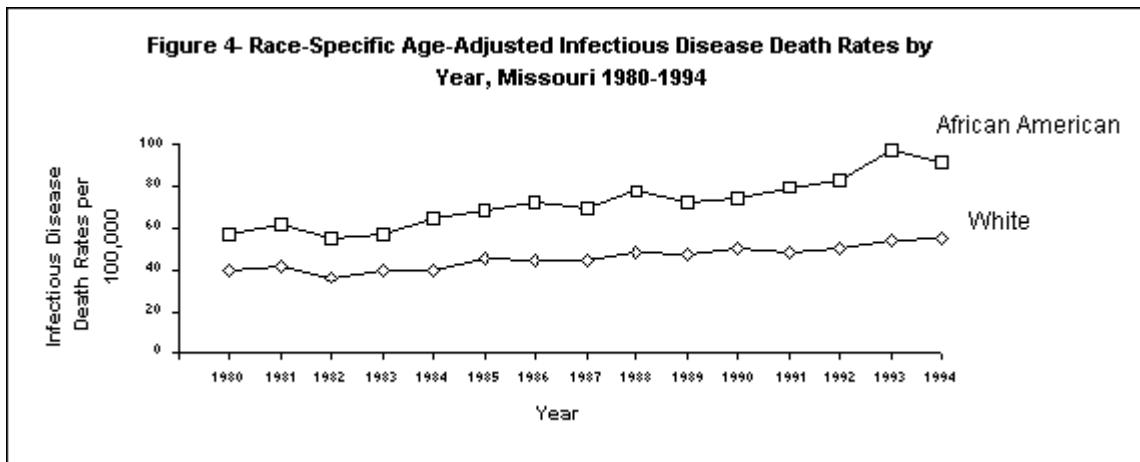


Figure 4



Provisional Vital Statistics for December 1996

Live births decreased in December as 4,399 Missouri babies were born compared with 4,652 in December 1995. Irregular reporting partly explains this decrease. Provisional data show a slight decrease for calendar year 1996, but final counts are expected to show a slight increase in live births.

Deaths increased in December, but show a slight decrease for the 12 months ending with December. The provisional 1996 death total is 54,093 compared with 54,222 in 1995.

With the decrease in births and the increase in deaths, the **Natural increase** in December was actually a decrease of 346 persons (4,399 births minus 4,745 deaths). Data for the 12 months ending with December show virtually no change in natural increase.

Marriages decreased slightly while **Dissolutions of marriage** increased in 1996. The marriage to divorce ratio for 1996 was 1.68 compared with 1.75 in 1995.

Infant deaths increased in December as 45 Missouri infants died compared with 38 in December 1995. For the 12 months ending with December, the infant death rate increased from 7.4 to 7.8 per 1,000 live births.

PROVISIONAL RESIDENT VITAL STATISTICS FOR THE STATE OF MISSOURI

Item	December				12 months ending with December								
	1995	Number 1996	Rate* 1995	1996	1993	1994	Number 1995	1996	1992	1993	1994	Rate* 1995	1996
Live Births													
Deaths	4,652	4,399	10.3	9.1	75,146	73,279	72,804	72,543	14.6	14.4	13.8	13.7	13.6
Deaths	4,009	4,745	8.9	9.8	53,655	53,611	54,222	54,093	9.8	10.3	10.1	10.2	10.1
Natural increase	643	-346	1.4	-0.7	21,491	19,668	18,582	18,540	4.2	4.1	3.7	3.5	3.4
Marriages	3,292	3,341	7.3	6.9	44,380	45,070	45,057	44,906	8.8	8.5	8.5	8.5	8.4
Dissolutions	2,063	2,435	4.6	5.0	26,438	26,441	25,726	26,708	5.0	5.1	5.0	4.8	5.0
Infant deaths	38	45	8.2	8.2	630	597	539	566	8.5	8.4	8.1	7.4	7.8
Population base (in thousands)	...	5,323	5,352	...	...	...	...	...	5,191	5,234	5,278	5,323	5,352

*Rates for live births, deaths, natural increase, marriages and dissolutions are computed on the number per 1000 estimated population. The infant death rate is based on the number of infant deaths per 1000 live births. Rates are adjusted to account for varying lengths of monthly reporting periods.

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